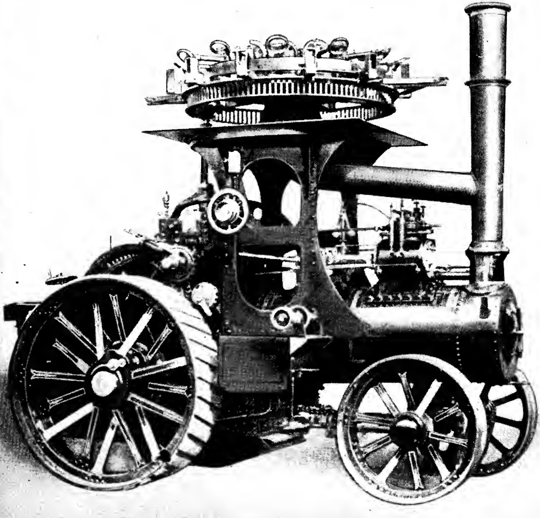
# THE MODEL ENGINEER



Vol. 96 No. 2401 THURSDAY MAY 29 1947 9d.

# The MODEL ENGINEER

*Percival Marshall & Co. Ltd., 23, Great Queen St., London, W.C.2*

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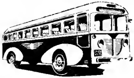




## SMOKE RINGS

### Our Cover Picture

LOVERS of the showman's engine, the traction engine and the road locomotive, will be interested in the illustration on our cover this week. For the original photograph we are indebted to Mr. C. E. Shackle, of Harlington, Middlesex, who loaned it from his private collection. The engine shown is a "Savage" single-cylinder traction-centre complete with the permanent "tower" carrying the turntable upon which the roundabout was pivoted. Pictures of traction-centres separated from roundabouts are rare, and we imagine that many readers may not previously have seen one. No actual example of such an engine is now known to exist, though they were fairly numerous forty to fifty years ago.

### Prize Pool Additions

I AM pleased to record some additions to the pool of prize money for our Exhibition referred to in a recent issue. Mr. S. E. Stevens has kindly provided £2 2s., Mr. George Archer £1 1s., and Mr. S. James 10s. 6d.

### An Exhibition Query

A READER who contemplates entering a model locomotive in the Competition Section asks whether his entry will be prejudiced by the fact that his engine is built from a set of castings purchased from a trade firm. The answer is very simple—his model will be judged entirely on its merits as an example of locomotive modelling, the main factors being its workmanship and finish, and its correctness to prototype if it represents a known class of locomotive. We do not expect competitors to make all their own castings, or even their own patterns, but if two models are very close together in the final judging, preference would be given to the one in which the competitor has done most of the work himself. This applies to boiler mountings and fittings as well as to the main castings and any pattern-making involved. The extra amount of workmanship put into the model would be the deciding factor, in the minds of the judges. A competitor who relied very largely on purchased parts might not secure a cup or a medal, but his production would be carefully considered and an award of some kind might be allotted to him if his effort called for appropriate recognition. I remember the case of a model liner of which only the hull represented the exhibitor's personal work. All the deck fittings were of a most elaborate kind, but were purchased ready-made at a cost of approaching one hundred pounds. It made a very impressive model, but, of course, scored very low marks as an example of the competitor's own handicraft. Building a locomotive from a purchased set of castings is in another category, since the rough castings all require machining and fitting and here is where the competitor can show his skill as a model-maker, as also he can do in the making of the boiler, the frames, and the various fittings and details. So let our correspondent get busy and prove himself a model locomotive builder from the raw materials, whether the castings are purchased or not. It is his workshop ability and his sense of a good locomotive which will count.

### Educating Juniors

AN outdoor track event organised by the Whitefield Society at Whitefield, in Lancashire, was notable for the success of a track laid at ground level and for the intense enthusiasm it aroused among the junior visitors. Some forty yards of track, in $3\frac{1}{2}$-in. and 5-in. gauges was laid down, the operating locomotives being Mr. W dsworth's $3\frac{1}{2}$-in. G.N. Atlantic and Mr. Gardiner's 5-in. three-cylinder "Mogul." In spite of some apprehension as to the safety of a ground-level track, the whole of the running was accomplished without a single mishap. The success of this meeting was repeated at another gathering held at Prestwich on May 17th. The Hon. Secretary is Mr. A. Stevenson, 2 Newlands Drive, Prestwich, Lancs.

*Model Engineers of the future at the Whitefield Society's Track Meeting*

### A Rush of Orders

WE have been asked by Messrs. Garner & Son, of Barnsley, to explain to customers that some inevitable delays have occurred in delivery of goods, due to the overwhelming rush of orders resulting from their advertisements in THE MODEL ENGINEER. They have found it necessary to suspend advertising temporarily for this reason, but they are still out to give the best possible attention to all enquiries, and hope to meet old and new friends again at this year's "Model Engineer" Exhibition.

### The "M.E." as a Business Magnet

A READER who recently used our "Sales and Wants" columns for the disposal of a partly-built "Royal Scot" locomotive has been surprised to receive an enquiry from up-country in India. In this case the locomotive was soon disposed of locally, so the Indian reader will be disappointed. It is not unusual for overseas readers to scan our small advertisement columns in search of a much wanted tool or model, but it is very rarely that they can hope to contact a private advertiser in time to secure a bargain. With established trade advertisers the position is different, for the firm and the goods are continually available. One regular trade advertiser recently wrote us to say that he was receiving replies from all over the world, and made the unique confession that a 2s. 6d. advertisement in our columns proved to be the foundation of his now very successful business. No doubt his 2s. 6d. was backed up by his capacity to supply both goods and service.

### Preserving Old Traction Engines

A LETTER from Mr. L. M. Massey, of Londonderry, makes a strong plea for the preservation of examples of old traction engines before they pass to the scrap-heap. He suggests that some of the model engineering societies might start a fund to buy up an old engine in their neighbourhood and present it to a local museum. It seems to me that this is rather beyond the resources of most model societies, but one of the senior engineering institutions might well consider the idea. The steam traction and ploughing engine as a type is a landmark in the history of mechanical engineering which is fast fading from the countryside. Good models may do much to enshrine its memory, but in years to come a real example of a traction engine may become as much a treasured piece of engineering history as is the old "Rocket" locomotive at South Kensington.

### "Old Bill" at Belfast

I HEAR that Mr. J. C. Crebbin's well-known locomotive, "Old Bill," secured top honours for its track performance at the recent Exhibition organised by the Belfast Society. It did three days continuous steaming totalling approximately 30 hours on the track and earned some substantial sums in passenger fares. The Govenor-General of Northern Ireland drove the first train and, I am told, handled the regulator in professional style. When he came off the footplate he invited "Uncle Jim" to tea, an indication of the warm-hearted hospitality so freely extended by all the Club members to their visitors on this occasion. Mr. Crebbin tells me that his demonstration of the value of the brick arch in firebox construction aroused widespread interest and approval, through the absence of smoke when the air admission was regulated.

Percival Marshall

# SHIP MODELS AT SHEFFIELD

**by "JASON"**

*THE Sheffield Ship Model Society* is to be congratulated on its (I think) Third Exhibition. It is one of the youngest of the societies and was just starting to walk on the outbreak of the war. Now again it is getting into its stride and, due to co-operation with their good friends *The Sheffield and District Society of Model and Experimental Engineers*, they were enabled to put on show several score of ship models in the Central Technical School, Sheffield, during the Easter Week. I was privileged to have a good look around and maybe some remarks on a few of the models may be of general interest. Like most other societies Sheffield has suffered from the war years. It is not easy to pick up all the loose ends so suddenly cut adrift in 1939.

Firstly I can say that the general standard has risen but not very much. I do notice a remarkable advance in the miniatures. Modellers like Money, Tearle, Drury and Edge, would be an asset to any society and C. Money's M. S. *England* (50 ft. to 1 in.) well deserved the *Miniature Trophy*. Messrs. Money and Drury are old exhibitors in London and both are artists in choice of subject and treatment and it is just in this direction that both excel. Many will remember Money's dilapidated *Coal Hulk* in the London 1938 M.E. Exhibition.

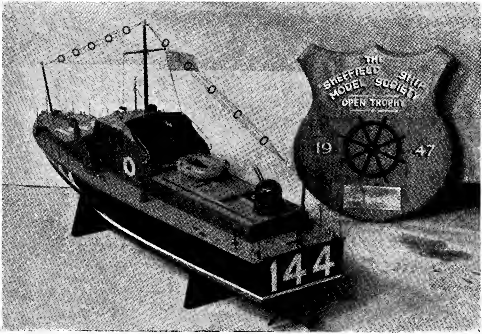



*Photo by*] [*R. V. Garside*
*The model and the Trophy! A ½-in. scale Walton " Thames " A.S.R.L. by W. J. Hughes*

Mr. Dennis Drury submitted in this year's Sheffield Exhibition *Coral Seas* which was awarded the *Cup for Accuracy*. The whole setting was an amazingly good picture of a passage through a coral reef with the foreground showing the swell and breakers. A square-rigged steam yacht at anchor in the lighter green of the anchorage contrasted with the deep blue of the deep water beyond the passage. If the yacht was somewhat close to the reef in the eyes of a sailor, yet it has to be admitted that sometimes a permanent current sets in a tideless sea. There are many such. Mr. Drury won because he kept free from errors in a difficult and unusual subject.

Originality is a quality prized by the Sheffield Society and the trophy for this was won by C. Money with his 4-masted barque *Pommern*. This model was also favourably noticed in the 1946 M.E. Exhibition. The perspective is foreshortened as it were, the model being flattened between

two glasses. Yet all detail is correct in profile, masts, spars, running and standing gear, sails and deck fittings. The *Pommern* is a combination of artistry and craftsmanship not easily to be surpassed.

A fine obstacle for the judge was the selection of the cup-winner for *Workmanship*. Yet on reflection none other was better fitted than J. Tearle's *H.M.S. Revenge*, made famous by Sir Richard Grenville's fight in the Azores. This Elizabethan ship carried out in the normal materials makes a good picture. Mr. Tearle however, used as his material, ***cardboard***. Now normally I do not hold with freak or abnormal materials for modellers. In some of my own modelling work I use shavings one-fiftieth of an inch thick and a quarter of an inch wide. I *start* with the shavings not once but many times, so I can understand some of the difficulties in cardboard. The *Revenge* was a built-up model, hull only, but with many deck fittings. She was painted in the gaudy Tudor style and her lines appeared to be reasonably correct. Only good workmanship and perseverance could have completed the work. I'm still wondering why cardboard was used. The carving was poor and the gun-decks followed the sheer line which is quite wrong.

The Sheffield Society's most important award is the ***Ship's Bell*** for the best model of the year by a member. Here the judging was not at all easy. There were half a dozen steamers, quite good one's too, which were in the running but there were very few sailing ships of a similar standard. The winner was *H.M.S. Victory* (1805) by P. G. Rawlings-Smith. *H.M.S. Victory* was far from being flawless. For example, his anchors caught my eye on two counts. They were wrongly shaped; the arms should be straight meeting at the crown in a definite angle. Mr. Rawlings-Smith used a piece of flat sheet metal for the crown, arms and palms. It is not a long job to file the anchors out of the solid. When adding the wooden stock don't be afraid to show it as a piece (better still 2 pieces) of wood with iron bands. Painting and finish is well worth his further study, yet there was a great deal of work in that model; work that was good. Perhaps

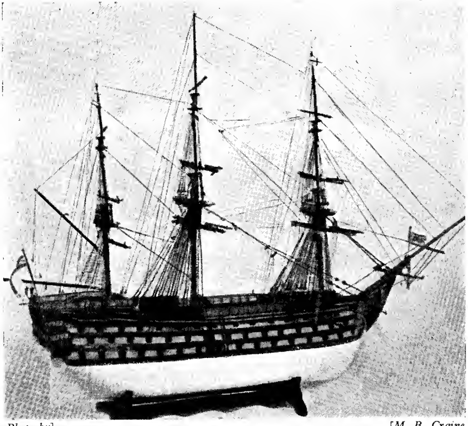


*Photo by*] [*M. B. Craine*

*A model of H.M.S. "Victory" (1805) by P. G. Rawlings-Smith. This holds the Society's Bell for the best model of the year*

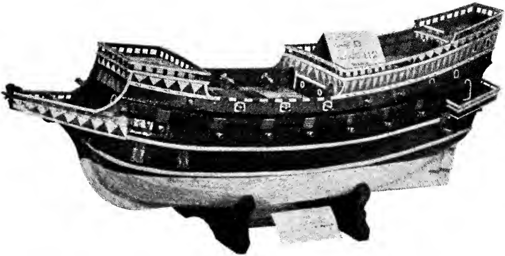


*Photo by*] [*M. B. Craine*
*Mr. J. Tearle's 2-foot model of H.M.S. "Revenge." The materials used are mainly cardboard. Awarded Cup for workmanship.*

the judge has imposed a standard upon Mr. Rawlings-Smith which he will *have* to strive for in the future. To those who ran close I would say, keep it up. The general level of the steamers in this class was good and I think the best of these was the *Lancastrian Prince* by D. S. Anthes who is a modeller of promise. This model was awarded the *Steamship Diploma,* one of the four diplomas awarded to the runners-up in the *Open Trophy.* I feel that Mr. Anthes is now finding his true avenue in the $\frac{1}{16}$ in. or $\frac{1}{8}$ in. scale.

Mr. Barton, a former winner of the principal award, this year showed a *Roman Corn Ship* after the Science Museum drawings. This entry was given the *Sailing Ship Diploma* as a runner-up for the *Open Trophy.* The workmanship was good and, as the award indicates, came near the premier prizes. It is generally accepted that heart-shaped dead-eyes were in use at that time and for this there is ample evidence.

I now come to the work of new members. Here we seek the "Bell" holders of the future

*A first attempt! Steam-driven cruiser with all-welded aluminium hull by E. J. Ellin.*

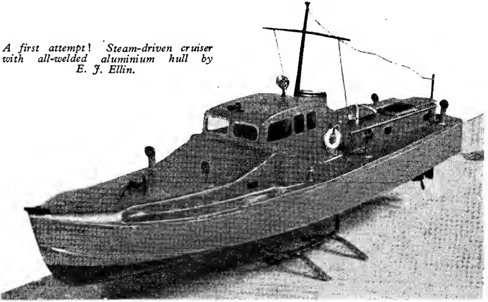


*Photo by*] [*R. V. Garside*

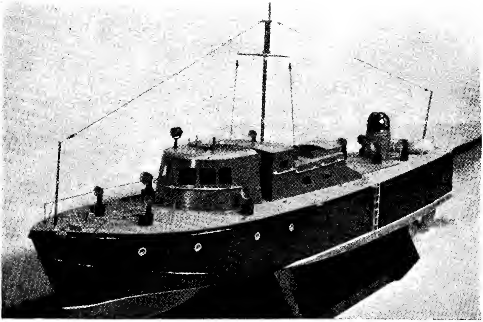


*Photo by*] [*R. V. Garside*

*A model Vosper A.S.R.L. by E. D. D. Adams*

and I think we have one such in Mr. A. Everall who exhibited *A Roman Ship*. He is in his right scale and with the benefits of club work in improving finish etc. will go far. He won the *New Members' Trophy*. Another member, Mr. Cordingly, ran him closely with a fine little model of a tanker. This miniature work shows excellent promise. Mr. Jenkinson can give full rein to his love of colour in remaining in Tudor work but of a more serious nature and at double the scale. The ***Elizabeth Jonas*** offers such scope without the need of deep research.

Now for the *Open Trophy*. This went to W. J. Hughes for his Air-Sea Rescue Launch. This was a powered boat and although the engines were not all the work of the competitor, his layout, craftsmanship, finish and details were excellent. It was a built-up hull and an extra open hulk was alongside to show the details. Deck fittings were all hand-made and there was a very satisfying finish. "Congratulations, Mr. Hughes!" By the way he is a Sheffield man. The *Power Boat Diploma* as a runner-up in the *Open Trophy* was awarded to E. D. D. Adams for his Vosper A.S.R. Launch to ¼ in. scale. The general standard on the power boat stand was quite good and I must specially mention R. Kerry's freelance Cabin Cruiser, *Bauxite*, as a fine example of beaten metal work.

J. R. Brooke's harbour scene containing half a dozen liners and steamers each one worthy of a place "in the lives." He should do well in a slightly larger scale in liners. Mr. Gray's work caught my eye as having promise.

In a yarn with the President, Chairman and Secretary, they told me of their hopes; a strong junior section and a "drive for new members." Sheffield needn't worry. They've got off the mark quite strongly and they have some excellent modellers especially miniaturists. Mr. Wood Smith has made a fine start on a Chinese Junk, although as President his duties are not onerous, yet he is a tremendously busy man in many other directions. Mr. Anthes, as Chairman, is fortunate (particularly for the Society) in having very considerable sea experience. Mr. Maltby is one of the most alert secretaries we have today. I've no fears for the future of the Sheffield Ship Model Society. Here are two tips. For small flags use rice paper or any of the tough and fine papers. Use mapping pens and coloured inks. Yellow may be difficult but your artists' colourman will supply without difficulty. For large scale ventilators I pass on a tip from the winner of the ***Open Trophy***, Mr. W. J. Hughes. He uses a metal punch and die for the cowl shaping and to this he solders the tubular stem. Run a drill up the stem for an opening in the cowl and there it is. For an additional refinement sweat on a wire rim to the cowl mouth.

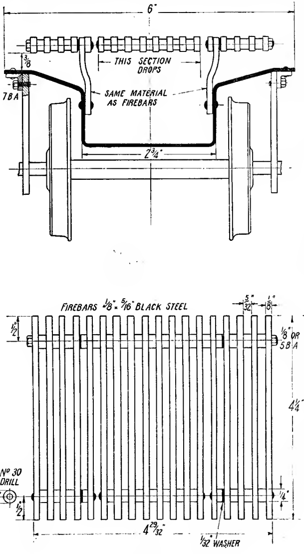
Here is a timely note about awards, cups and trophies. Generally speaking, all the provincial societies, when more or less established, award one or more trophies as a means of encouraging their members. This is a most excellent and praiseworthy policy. It ensures internal criticism and it makes for a better standard. The London Societies fortunately have not had to resort to awards, because "The Model Engineer" Exhibition happens annually on the doorstep. Moreover, there are many awards and diplomas of various kinds.

# "L.B.S.C."

# GRATE AND ASHPAN FOR "HIELAN' LASSIE"

WHEREVER possible, I always try to arrange for the whole of the grate and ashpan to "dump" clear of the engine, in order to leave the bottom of the firebox perfectly unobstructed, for cleaning out and other purposes; but in the case of a wide-firebox engine having a trailing axle running in bearings attached to the frame, this is rather a problem. Where there is a pony truck, the pivot can either be attached direct to the bottom of the ashpan, the latter being made stout enough to stand the stress, or it can be attached to a bracket riveted to the ashpan, and bearing on a cross-member at the trailing end of the main frames. Two of my own engines were arranged thus, and it is very convenient, as the removal of one pin frees the whole issue—grate, ashpan, and pony truck.

However, a "complete" dump on the "Lassie" would involve dropping the axle-boxes out of the horn slots, and you couldn't do it just by pulling out one pin; so I have compromised by providing a fixed ashpan of the hopper type, and specifying a set of firebars in three sections, the middle one of which drops down into the hopper and decants the residue "through the back door," in a manner of speaking. Ample depth is given below the bars, and the sides of the grate cannot be chocked up by an accumulation of ash, as is usually the case on the wide-firebox engines having an ordinary shallow ashpan, as anything falling through will slide down the side wings into the hopper. Neither grate nor ashpan is attached to the boiler; the ashpan is supported by the trailing frame or cradle, being fixed by bits of angle at each end, and the firebars are supported on four legs which are riveted to the sides of the hopper. When the boiler is erected, it is simply dropped into position over the complete assembly, the foundation-ring just resting on the sides of the hopper, and the grate automatically taking up its correct position inside the firebox. The centre part which drops, will be retained in position, when the engine is working, by a device which I will describe when the boiler is erected.




*Grate and ashpan*

### Firebars in Three Sections

The grate is composed of eighteen firebars, each $4\frac{1}{4}$ in. long, and made from $\frac{1}{8}$-in. by $\frac{5}{16}$-in. black steel strip, which is a commercial article. Incidentally, cast-iron would be better, as it lasts longer (on the old Brighton engines, we found that cast firebars lasted ever so much longer than "cut" bars) and maybe some of our enterprising advertisers will take a gentle hint

and supply the three sections of the grate—an eight-bar section for the movable part, and a five-bar section for each side — already cast, complete for erection, only needing drilling for the supports. If the cut bars are used, mark one off by making a centre-dot ½ in. from each end; drill No. 30, and use it as a jig to drill all the others.

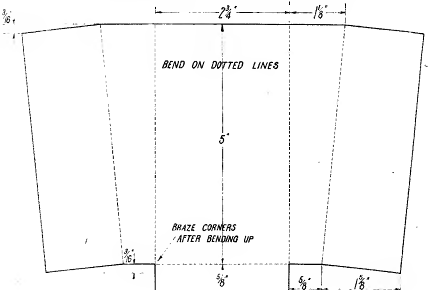
Twenty-eight spacers are needed. Chuck a piece of ¼-in. round steel in three-jaw; face, centre, and drill down about 1 in. with No. 30 drill. Part off 5/32-in. slices until you reach the end of the hole, then repeat operations until you have 28 of them. Cut a piece of ⅛-in. round rustless steel 5⅛ in. long, and put three or four turns of ⅛-in. or 5-B.A. thread on each end, enough to take a thin lock-nut. Next, cut four pieces of the same material used for firebars, but approximately 1¾ in. long. Make centre-pops on one at 1¼ in. centres, drill No. 30, and use as a jig for drilling the other three. We are then ready to assemble.

Screw a nut tightly on one end of the long bearer, put on a bar, then a spacer, then "ditto repeato" until you put on the fourth bar; then put on a 1/32-in. washer, and one of the grate supports. Then more bars and spacers until you arrive at the fourteenth bar; between that and the fifteenth, put another support and another 1/32-in. washer. Spacers go between the rest, and finally put on the lock-nut. Note: the nuts, when screwed right home, must *not* clamp the whole grate tightly; the bars must be left free to move on the bearer, otherwise the central part will not be able to drop, as it uses the bearer for a hinge-pin. This is also one of the ideas for making the bearer from a bit of rustless steel rod; if ordinary mild or silver-steel is used, it corrodes, and prevents dumping of the grate.

Now cut two pieces of ⅛-in. rod to a length of 1⅜ in., and another to 2¼ in. length. Burr over one end of each. Thread a short one through five of the bars at the opposite end of the grate, putting spacers between the first three bars, and a 1/32-in. washer and support between the fourth and fifth. Both ends of the bit of rod are then riveted over, so as to hold the five bars together tightly. Repeat this performance at the other side of the grate; then finally do the centre section of eight bars, putting spacers between each. When finished, the centre part of the grate should be quite free to swing between the outer sections; if stood on its supports on the bench, the centre part should drop easily by its own weight.

## Hopper Ashpan

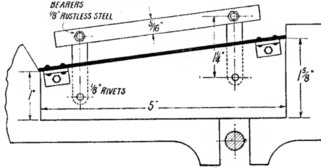
The ashpan can be made from a single piece of 16-gauge sheet steel, bent to shape and brazed at the front corners. The lower part of the front is closed, to prevent ash and grit getting on the motion work. A piece of steel approximately 8⅜ in. by 5¾ in. will be needed; this is marked out as shown on the accompanying sketch plan, cut to outline and bent on the dotted lines to the hopper-shape shown in the cross-section. The extreme width over the "wings," is 6 in., and the vertical sides of the base should be approximately 1⅛ in. at the back, and ⅝ in. at front. There is not the slightest need to bother about "mike" measurements, as long as the blessed thing fits the cradle and catches the bits dropped from the fire. Bend up the tongue piece at the front end, so that it closes in the front of the vertical part of the hopper, and braze the corners; anybody who has an oxy-acetylene blowpipe can do this with a spot of Sifbronze, quicker than soldering up a leak in the domestic kettle. Use 120-litre tip for jobs like these. All blowlamp users need do, is to stand the ashpan end up in the brazing pan, put a fillet of wet flux (Boron compo) in




*Ashpan "in the flat"*

each corner, lay a bit of brass wire in the flux, and heat up the end of the ashpan with their blowlamp until the brass wire melts and runs into the corner cracks.

Now fit the hopper to the cradle or trailing frame. You'll find it will drop in fine at the rear end, but at the front end it will need a little bit of jerrywangling to get it to sit nicely between the sides of the frame where they close in. This can be overcome by altering the angle of the sloping sides of the hopper at the front end, flattening them out a bit; but you'll see far better from the actual job, how to do this bit, than I could explain by yards of instructions. Anyway, when you have got the whole doings to sit nicely in the cradle, not forgetting to have the base quite central, so that the trailing wheels don't foul it when they slide from side to side on a curved road, rivet a piece of $\frac{5}{16}$ in. by $\frac{1}{16}$-in. angle at each end, so that it touches the outside of the frame. A 3/32-in. or 7-B.A. screw is then put through a clearing hole (No. 40 drill) in each piece of angle into a tapped hole in the trailing frame, as shown in the illustrations.



*How to erect grate and ashpan*

Finally, the grate has to be mounted on the ashpan, which is a simple job. Put a slight bend, or "set," as the shopmen call it, in each leg or support, so that they will fit between the vertical sides of the hopper. Set the grate in place, so that the bottom of the bars will be approximately $1\frac{7}{8}$ in. above the bottom of the base at the rear end, and parallel with the slope of the ashpan. The front end of the grate should be about $\frac{5}{16}$ in. short of the front end of the ashpan. Drill four No. 30 holes through the sides of the ashpan, corresponding to those in the lower ends of the legs; put in either $\frac{1}{8}$-in. rivets, or $\frac{1}{8}$-in. or 5-B.A. screws, with nuts inside the ashpan, and the job is complete. All we need now, is the smoke-box saddle, and the boiler can then be erected, and connected up. The "Lassie" will soon be ready for a trial run!

## Who Started Concrete Viaducts?

Last week, time of writing, a letter came to hand from Mr. C. Snowdon, Secretary of the Sunderland S.M.E., claiming that his club, and not the West Riding Small Locomotive Society, originated the idea of building a railway on a concrete viaduct. He says that such an erection was put up in Roker Park; and other clubs, including the W.R.S.L.S., were invited to see it. Whilst I am glad to give publicity to the above statement, I would point out that Mr. W. D. Hollings did not claim originality for the method of construction employed in his club's railway; what he *did* claim was, that it was the most substantial and solidly-built structure of its kind to be so far installed. To the best of my knowledge and belief, he is, in that respect, quite correct.

However, neither the Sunderland nor the West Riding clubs were the originators of the concrete viaduct idea. When I first thought of putting up a line at my old home at Norbury, I considered concrete construction, and got in touch with a concrete manufacturer to see what it would cost, if feasible. The kind of viaduct he suggested was very similar to the "bone of contention" mentioned above; but the price—oh boy! it was too much for my very limited financial resources at that time, and I had to be content with sixty-five feet of twin 3-in. by $1\frac{1}{2}$-in. wooden longitudinals on 4-in. by 2-in. wood posts, the cross-ties or sleepers being builders' laths at a few pence per bundle, cut into 5-in. lengths. It wasn't very substantial, and it took about a fortnight to erect, but history was made on it, as old followers of these notes know full well.

The first actual concrete viaduct that I ever heard of, or saw "in the flesh," was made and erected by my late and ever-lamented friend, Freddy Crompton, who took photographs of my locomotives in the early days of these notes. After he contracted T.B. and spent six months in the sanatorium at Midhurst, Sussex, he went to live at Herne Bay, Kent, and it was there that he put up his concrete viaduct, casting each arch in position. It wasn't a "prefab" job like the modern version. The moulds for the arches, which were of the usual semi-circular type, were built up in place, and the concrete mixture poured in; when set, the mould was removed, re-set for the next arch, and the operation repeated. The completed line looked like a very young relation to Ouse Viaduct on the old Brighton main line; a picture of it, with a locomotive in action, was shown in these notes, getting on for twenty years ago.

The second concrete viaduct that came to my knowledge, was a similar form of construction erected by Mr. Edward Feck, who used to keep a hotel at Oulton Broad, in Norfolk. Mr. Feek's

viaduct differed from Freddy Crompton's, in the shape of the arches, some of which were diamond-shaped. I don't know whether either of them are now in existence, Fred having, alas! passed to the land beyond the Jordan, and Mr. Feek, having removed to "fields and pastures new." Anyway, whatever their fate, it looks as if the concrete viaduct railway has come to stay; for the Sutton club (which did your humble servant the honour of putting my name among the vice-presidents) are now about to get busy on their permanent out-door line at Chatham Close, North Cheam. The committee has already decided on the reinforced concrete substructure, as used by the Sunderland and West Riding clubs; and at time of writing, have under consideration the West Riding track construction. Mr. Hollings kindly forwarded to me a small section of the track, when sending the photographs and information; and I passed this on to the Sutton secretary, Mr. P. G. Johnston, so that the track committee could see the actual thing.

The wooden longitudinals on my own railway, which are twin 4-in. by 2-in. with "internal fish-plated" joints, are showing signs of anno Domini, the wood being soft and partly rotted in places—not to be wondered at, seeing that it has had to withstand the vagaries of the British climate since the fall of 1936—and I would dearly love to replace it by concrete arches or steel girders on the existing concrete posts, but time and circumstances don't permit, so I shall have to be content with replacing the defective portions with fresh wood when opportunities occur. The rails, of hard extruded brass alloy, have stood up wonderfully well, and will probably "see me out." Incidentally, the *ex*-L.B. & S.C.R. signal from Coulsdon Station now stands beside the line and does its duty nobly, to the amusement of the enginemen on the adjoining full-sized railway, who, of course, recognised it as soon as it was erected. I took advantage of the sunny afternoons in mid-April to give it a spring-clean and a paint up; and now, resplendent in black and white, it doesn't half "show up" its one-time fellow conspirators still in service close handy on the bank, a few yards to the north. As the lamp burns a week or more on a pint of paraffin, I leave it alight; it looks kind of "friendly" shining down the line at night, as if expecting old "Ayesha" to come buzzing along with the night boat train. I have had a locomotive out several evenings after dark, and the sight of the green light showing up as we swing around the north curve, brings back many a happy memory of seeing the same sight through the cab window of a Brighton engine. A few of the local small kiddies are a bit puzzled over what a full-sized signal is doing alongside my little railway, especially as they can see the light at night from their back gardens.

They will have a bit more to puzzle over when it works "all by itself," as I hope to fit the automatic gear during the next few weeks. Mr. O. S. Nock, whose excellent articles on signalling appeared in this journal a little while ago, has obtained for me a Westinghouse magnetic air-valve, so that all I have to do, is to rig up an air-cylinder and do a little track-circuiting. I guess the old signal will wonder what on earth is happening; for after being pulled about with a moving wire for over forty years at Coulsdon Station, and relying on the signalman's aid and brain to give correct indications to both steam trains and Milly Amps, it will be able to give indications on its own, by aid of a puff of wind, and a wire that doesn't move at all!

### A Hefty $3\frac{1}{2}$-in. Gauger

The locomotive shown in the accompanying illustration might be aptly described as "Juliet's" opposite number, because she is exactly the reverse in all ways to the simple little lady mentioned. She was built by one of the founder-

(*Continued on next page*)

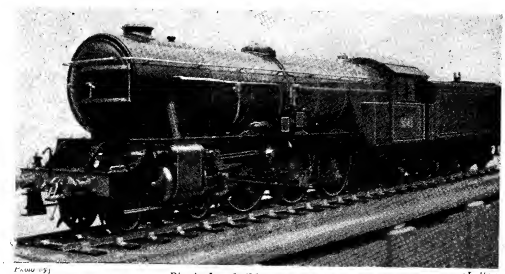
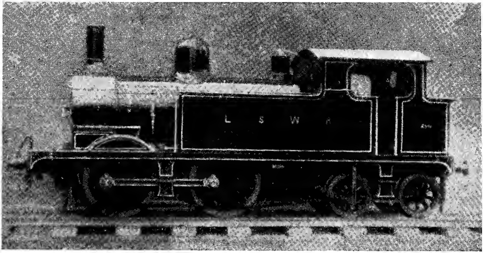


Photo by] *Birmingham builds bonny babies!* [J. Henn

# A 1-in. SCALE ADAMS TANK



THE photograph shows a 1-in. scale L.S.W.R. tank locomotive which I have recently finished. The prototype is the "O2" class of 0-4-4 light passenger engine designed by Mr. William Adams, sixty of which were built at Nine Elms between 1885 and 1889. The model represents No. 214 as originally built.

The cylinder bore is $1\frac{5}{16}$ in. and the stroke is 2-in. The maximum valve travel is $\frac{3}{8}$ in., and the working pressure is 80 lb. per sq. in.

All patterns had to be made at home, since no castings suitable for the model could be obtained on the market. All the turning was carried out on a 3-inch lathe, and other machining was done on a small hand planer and a drilling-machine.

In view of the various references, some time ago, to left-handed mechanics, readers may be interested to know that I am left-handed. Much valuable information and many useful hints were obtained from THE MODEL ENGINEER.—H.W.

## "L.B.S.C."

*(Continued from previous page.)*

members of the Birmingham S.M.E., to wit, Mr. A. W. Sarsons, and the job took eight years of spare time—as the old saw truly says, patience is a virtue! Our worthy friend made all the drawings, all the patterns, except the wheels, and all the fittings, except the steam-gauge. He also carried out the job of painting and lining the engine, which was the worst job of the lot.

The locomotive generally is based on London and North Eastern practice, but she is built to the American loading gauge, which makes her a tidy size and weight; but Mr. Sarsons did his best to keep to proper proportions, and the engine certainly presents a pleasing and symmetrical appearance, which is more than can be claimed for some of the awful nightmares disgracing our main lines today. She has a 5-in. diameter boiler containing a long combustion chamber with ten water-tube struts in it, and plenty of superheat. The boiler is fed by a twin-barrelled pump driven by eccentrics on the middle coupled axle, a Weir type donkey pump on the left-hand running-board, and an injector under the footplate; so if the driver lets the water get low enough to melt the lead plug, he deserves all that is coming to him, and a bit extra for luck! All the fittings are made to the instructions given in these notes.

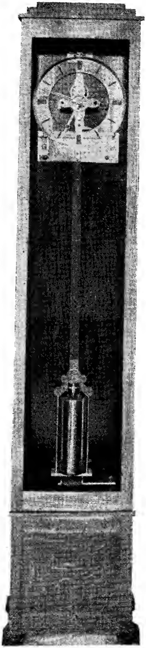
The cylinders (two only) are $1\frac{3}{8}$-in. bore and $1\frac{3}{4}$-in. stroke, with slide valves on top, actuated by Walschaerts gear, which Mr. Sarsons set out himself, and has proved perfectly satisfactory. It is reversed by a "pole" lever. Other details include working cylinder cocks and steam sanding gear; and both engine and tender are fitted with working vacuum brakes, like those I described for "Maisie." The engine and tender measure 5 ft. long over buffers, and the weight in working order is approximately 150 lb. The locomotive will handle loads of eight to twelve adults, depending on the condition of the road, and the free-running—or otherwise—of the rolling stock. During the summer of 1943, she ran at every week-end in Bournville Park, hauling loads of kiddies; and on the Whit-Monday the Lord Mayor of Birmingham acted as driver for some time, and was tickled to death with the experience. He certainly had the right engine for the job, anyway, and our worthy friend deserves sincere and hearty congratulations both for his fine work and his endeavour to give others, especially the kiddies, a share in his pleasure.

# A Seconds Pendulum ELECTRIC CLOCK

by C. ALDHAM

EVER since I can remember, I have always been interested in making things. As a child, I was a constant visitor to the South Kensington Science Museum, and used to come away with the great desire to possess a museum of my own. Early attempts were boats carved from solid pieces of wood, which, of course, would never float, and aeroplanes which would never fly.

About 1930 I really started to collect some tools, and well remember foregoing my summer holiday in order to purchase an old 4-in. Drummond treadle lathe, on which the prize-winning model described here was made.



### Early Successes

In the 1936 MODEL ENGINEER Exhibition I exhibited a six-cylinder rotary aero engine and an electrically-driven cross-channel steamer; the former was awarded the Geary prize and commended, the latter was awarded a diploma, commended.

My next model was a $2\frac{1}{2}$-in. gauge G.W.R. "Pacific," *The Great Bear*. This was also made on the 4-in. Drummond, and took nearly four years to complete.

I have always been fascinated with pendulum clocks, and after reading "Electric Clocks and Chimes," decided to have a go at the seconds pendulum model.

Strangely enough, a good deal of this model was made from "blitzed" material.

The gears were taken from an old clock. The frames were cut from $\frac{1}{8}$-in. brass plate already in stock, and the pleasing mottled effect was done by spinning a piece of wood (about $\frac{1}{8}$ in. dia.) in the lathe and just letting it wander over the plate without following any design. A little rouge powder mixed with oil helps to make the marking more definite.

### Scrap Materials

The platinum contacts were turned from a pair of old magnetic contacts. The pendulum bob is filled with lead (about 10 lb. of cuttings from lead-covered cable).

It was impossible to obtain any new wire with which to wind the solenoid, but I managed to get hold of an old circuit-breaker coil, and wound it straight on to the bobbin. The most difficult job was to find the material for the case.

Eventually, I came across an old oak window-sill, salvaged from some bombed premises. It was in a terrible condition, full of splits, but after careful marking-out and a lot of hard work with a hand-saw, I managed to get enough timber for the case.

The next snag was the glass; this came from the remains of a "blitzed" shop-window, which, as it was $\frac{1}{4}$-in. plate, I had bevelled.

By the way, I must mention that all the material was obtained from a builder in a legitimate manner.

The whole job took about six months, and is behaving very well. Its time-keeping qualities are really remarkable.

I have recently obtained a $3\frac{1}{2}$-in. Drummond lathe, and am at present overhauling it and making sundry accessories for my next model, which is—who knows?—I don't.

# THE "IDEAL LATHE" COMPETITION

## *ENTRY No. 3. by G. A. WILLIAMS*

**Specification for Motorised $3\frac{1}{2}$-in. Centre Gap-Bed Screw-cutting Lathe**

Item 1. Cast-iron bed on which are machined the slides for compound rest, tailstock and headstock.

„ 2. Metropolitan-Vickers type D57, push-button starter, bolted into cored hole in lathe bed.

„ 3. Cover plate over cored hole which provides access to line and motor leads.

„ 4. Metropolitan-Vickers type BKS. 2408 (sleeve bearing), $\frac{1}{4}$ h.p., 1,425 r.p.m., 50 per., 230-250-volt split phase a.c. motor mounted under lathe bed.

„ 5. Cast-iron headstock which is bolted and dowelled to lathe bed.

„ 6. Tapered roller-bearings (Timken or Skefko heavy series $1\frac{1}{4}$-in. bore) in housings machined in Item 5.

„ 7. $1\frac{1}{4}$-in. dia. mandrel, bored $\frac{1}{2}$-in. dia. right through and nose-end tapered No. 2 morse taper. Shoulder at nose-end bears against Item No. 6 and screwed for faceplate and chucks. At rear end mandrel is screwed and two lock-nuts to provide preloading and adjustment for bearings, Item 6. Rear-end turned down to $\frac{3}{4}$-in. dia., for change wheels for screw cutting.

„ 8. Cast-iron gear case bolted to lathe bed and headstock and carrying short shafts for gearing.

„ 9. Cast-iron gear case cover the inside of which carries bosses which are approximately $\frac{1}{16}$ in. clear of short shafts in gear case to prevent the gears running off shafts and to ensure cover is in position when lathe is running.

Item 10. Knurled nuts holding Item 9 to Item 8.

„ 11. Quadrant for screw-cutting change wheels pivots on lead screw and fixed in position by bolt in slot in gear case.

„ 12. Hard shaft steel lead screw $\frac{3}{4}$-in. dia., cut 8 turns per inch, Acme standard screw thread.

„ 13. Ball-bearing thrust washer on lead screw.

„ 14. Cast-iron slide with slides and $\frac{1}{2}$-in. dia. screw for cross-slide.

„ 15. Cast-iron slide carrying T-slots.

„ 16. American pattern steel tool holder.

„ 17. Handwheel driving worm-wheel.

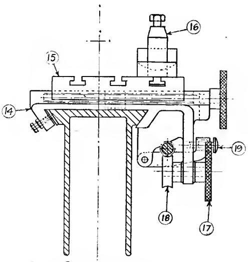
„ 18. Worm-wheel which engages lead screw, Item 12, for traversing slide Item 14.

„ 19. Half nut held in engagement with lead screw by poppet.

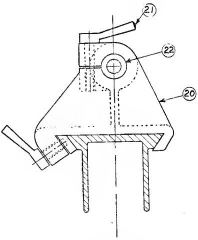
„ 20. Cast-iron tailstock.

„ 21. Clamp bolt for clamping mandrel in tailstock.

„ 22. $1\frac{1}{4}$-in. dia. mandrel bored $\frac{1}{4}$ in. right through. Nose-end tapered No. 2 Morse taper. Hand-wheel end screwed $\frac{5}{8}$ in.



Section W-X



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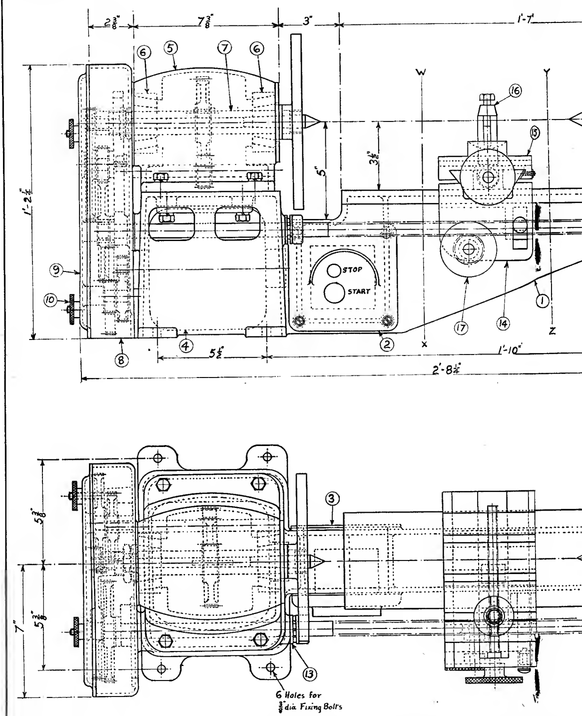
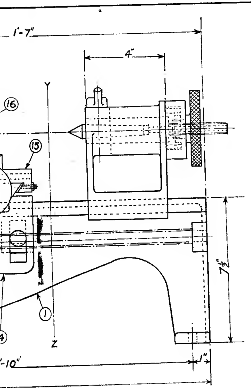
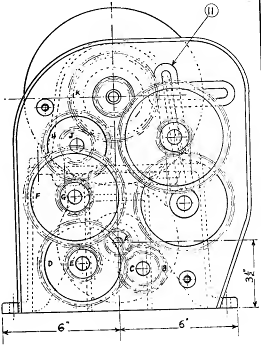


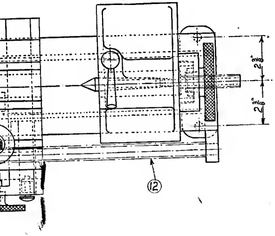

*Mr. G. A. Williams' design for a motorised $3\frac{1}{2}$ in. centre gap-bed screw-cutt*




**Details of Motor-drive Gears**

A — 1¼-in. Pitch circle diameter. B — 2½-in. P.C.D. C — 1¾-in. P.C.D. and D — 4¼-in. P.C.D. These two gears can be changed round on shafts. E and F—The following ratios should be supplied interchangeable on the same centres, 1 : 1, 1 : 1½, 1 : 2, 1 : 3. G — 1¾-in. P.C.D. H — 3½-in. P.C.D. J — 1¾-in. P.C.D. K — 4½-in. P.C.D. Gears for shafts E and F to have the same size bore as the change wheels for screw-cutting and then the gears can be included in the set of wheels for screw-cutting. Gears A and C may be fabric bakelite for silent running.




*...p-bed screw-cutting lathe*

With the gears stated, the following mandrel speeds may be obtained (motor speed, 1,425 r.p.m.)

| A-B | C-D | E-F | G-H | J-K | Total | Mandrel speed, r.p.m. |
|---|---|---|---|---|---|---|
| 2 : 1 | 3 : 1 | 3 : 1 | 2 : 1 | 3 : 1 | 108 : 1 | 13.2 |
| | | 2 : 1 | | | 72 : 1 | 19.7 |
| | | 1½ : 1 | | | 54 : 1 | 26.4 |
| | | 1 : 1 | | | 36 : 1 | 39.5 |
| | | 1 : 1½ | | | 24 : 1 | 59.3 |
| | | 1 : 2 | | | 18 : 1 | 79.1 |
| | | 1 : 3 | | | 12 : 1 | 118.7 |
| 2 : 1 | 1 : 3 | 2 : 1 | 2 : 1 | 3 : 1 | 8 : 1 | 178.1 |
| | | 1½ : 1 | | | 6 : 1 | 237.5 |
| | | 1 : 1 | | | 4 : 1 | 356.2 |
| | | 1 : 1½ | | | 2 2/3 : 1 | 534.3 |
| | | 1 : 2 | | | 2 : 1 | 712.5 |
| | | 1 : 3 | | | 1 1/3 : 1 | 1,068.6 |

# THE "M.E." EXHIBITION—What Others Think

ONE of the pleasing features of "The Model Engineer" Exhibition is the friendly co-operation extended to it from various trade quarters. A very welcome example of this is to be found in the following article which is being widely distributed by Modelcraft Ltd. to their many customers. It is of particular interest by reason of the practical advice it gives to intending competitors, and the encouragement it extends to those who may be a little doubtful if their work is up to exhibition standards. It is well worth quiet perusal and reflection ; here it is :—

"The next issue of *Modelcraft* will be coming out while 'The Model Engineer' Exhibition is in full swing, so we take this opportunity of reminding you about it now, well in advance.

Last year was a record in attendance and in entries for the competitions. It was also memorable for the tip-top quality of the work displayed. But there is another thing that sticks in our recollection, and that is the remarks of the visitors. It was not the comments of the experienced model-makers, who were studying the technique of their fellow craftsmen, which struck us. It was the comments of the 'laymen' and beginners. They were lost in wonder at the patience and artistry of the master hands. Some were fired with enthusiasm to follow in their footsteps, but far too many accepted the humble view that they themselves could never aspire to such perfection.

Now this is pure faintheartedness. Every man (or woman) who has modelmaking in his blood, and we sometimes think this means literally everyone, can build a good model. It is a matter of taking trouble, making haste slowly, and extracting every ounce of enjoyment from the task in hand.

Making a model is best done slowly, like eating a good meal. If you skimp anything, just as if you bolt your food, you will miss some pleasure at the time and regret it afterwards! If you take trouble you will find you have got more fun out of your task and perhaps, almost to your own surprise, have achieved a near-masterpiece as well.

So it is of particular interest to our readers that this year it is the intention to give more encouragement to the average modelmaker. The super-exhibits will be on show, but, and we think this important, encouragement is going to be given to the kind of model you and I can make if we are ambitious and painstaking enough to put in that little extra care and attention to detail.

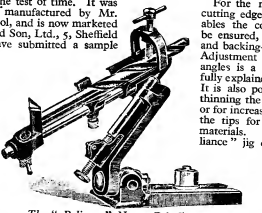
Perhaps you have thought that your model work, pleasing as it has been to you, is not up to exhibition standard and have accordingly never considered an entry. Do not take this view. Take a look at the model which has pleased you most and check it over carefully. Probably the careful re-fashioning of a few parts will make all the difference. You have quite a few weeks in which to carry out the work. If you feel the desire to attempt it, then write to the "M.E." for a list of the various classes and entry details.

A novel competition will be for ingenuity, etc., in making models, the materials for which—scrap or otherwise—have not cost more than 5s. The materials for the average ship model need not cost more than this figure, but one would not be able to purchase ready-made dead-eyes or cannon for example—real modelmaking, in fact, is called for.

We shall be there looking forward to seeing you, and if these few lines prevail upon you to make an entry, write and let us know—it will please us."

# The "Reliance" Twist-Drill Grinding Jig

OF the many devices which have been introduced to facilitate the accurate grinding of twist-drills, this is one of the most popular, and has stood the test of time. It was invented and originally manufactured by Mr. W. Crowther, of Liverpool, and is now marketed by Messrs. T. Garner and Son, Ltd., 5, Sheffield Road, Barnsley, who have submitted a sample for our inspection and test. We find it to be a useful and versatile appliance, which can readily be adapted to practically any power- or hand-driven grinder, being fixed to the table or base-plate of the machine by a single bolt through the slotted base. The smallest size, No. 1, takes drills from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. diameter, and is the most suitable for model engineering requirements, the larger sizes, 2 and 3, take drills up to 1 in. diameter, and 2 in. diameter respectively.


*The "Reliance" No. 2 Grinding Jig*

For the normal grinding of the cutting edges of drills, the jig enables the correct angle of point to be ensured, also correct clearance and backing-off of the cutting edges. Adjustment of the position and angles is a simple matter, and is fully explained in the leaflet supplied. It is also possible to use the jig for thinning the flutes at the drill point, or for increasing the cutting rake at the tips for dealing with special materials. In addition, the "Reliance" jig can also be used as a compound-angle device for grinding other tools, or for holding work in machining operations which normally present very awkward problems.

# PETROL ENGINE TOPICS

# * A 15-c.c. FOUR-CYLINDER ENGINE

## By Edgar T. Westbury

HAVING completed the camshaft by turning the journals to size, case-hardening and polishing the cams and journal surfaces, the bushes in which it runs can now be made. These are plain bushes, made from medium hard gun-metal or bronze, and pressed into the ends of the camshaft tunnel. If desired, they may be secured or positively located by grub screws tapped into the walls of the main casting, but with reasonably good fitting, this should not be necessary.

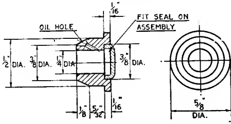



*Fig. 26. Flywheel end camshaft bush*

Oil holes should be drilled obliquely from the inner end of each bush, and well countersunk to catch oil splashed up by the cranks, the holes being disposed upwards or slightly inclined towards the cylinders. A blind-ended bearing is desirable on the flywheel end of the camshaft, to avoid oil leakage at this point, but in view of the difficulty of finishing a blind bore accurately, it is suggested that the bush should be drilled and reamered right through, and the seal, if any, fitted afterwards. As there is only $\frac{1}{8}$ in. between the end of the camshaft tunnel and the flywheel, however, there is not much room to fit anything projecting beyond the flange of the bush, and the best thing to do will be to make a little recessed cap, to be pressed or sweated into the counter-bore at the mouth of the bush. (Fig. 26.)

This fitting is only advocated in the interests of keeping the engine externally clean, and in the event of it not being considered necessary, the counterboring of the bush may also be dispensed with.

The inner end camshaft bush (Fig. 27) is turned down to act as a dowel or aligning spigot for the timing endplate. It is, of course, essential that the outside of each bush should be quite concentric with its bore, and the usual precautions should be taken to ensure this.

### Timing Gears

The gears specified for this engine are 40 diametral pitch, with 20 and 40 teeth respectively; both the size and the pitch are very common, and the gears should not be difficult to cut in the lathe, or have made to order. I strongly recommend that model engineers should tackle their own gear-cutting problems wherever possible; the equipment necessary is by no means elaborate, and sufficient information has been given in THE MODEL ENGINEER articles, including the recent series on "Milling in the Lathe," to enable even the beginner to grasp the essential procedure.

Should it happen that 40 d.p. cutters are not

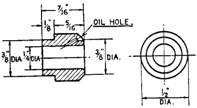



*Fig. 27. Timing end camshaft bush*

available, the pitch of the gears may be modified within fairly wide limits, so long as the correct ratio of gearing is maintained, and pitch diameters approximate. Gears from, say, 30 d.p. to 60 d.p. are permissible, though the finer pitches require to be cut very accurately to run sweetly; with ordinary gear-cutting facilities, it will generally be found that gears with a small number of teeth work quieter and wear better than those with a large number of teeth. It is quite in order to use metric pitch teeth, despite the slight variation in diameter which these entail, because the use of a "staggered" idler enables the meshing of the gears to be adjusted to compensate discrepancies in this respect.

For best results, the gears should be made of dissimilar materials. I recommend that the large spur wheel should be of bronze, and the two pinions of mild steel, that on the crankshaft being left soft, and the idler case-hardened. In this way, each of the gears will mesh with one of different wearing properties.

The spur wheel (Fig. 28) fits a taper on the camshaft, and in addition, a small Woodruff key is shown to enable positive timing location to be obtained. It is possible to cut this keyway with one of the small rotary cutters of the "dental burr" type, and to plane the internal keyway with a tool in the lathe; but keying at this point should be regarded as an optional feature, and speaking from personal experience, I regard a well-fitted taper as ample security.

There is, of course, the objection that in the absence of positive location, the camshaft must be re-timed whenever the engine is re-assembled after dismantling, but this is by no means a

*Continued from page 615 "M.E." May 15, 1947

formidable undertaking, and the friction fitting allows of small adjustments in timing to be made for experimental purposes. Cutting small keyways is a rather finicky job, even with the best care and skill, as it only needs one or two thousandths error in the centring of the cutter to produce a serious angular error in a shaft of this size. This can be corrected by fitting a stepped key, but I imagine few good engineers would condone this expedient.

The crankshaft pinion (Fig. 29B) not being on a taper, is rather different in this respect. My usual practice is to fit a small "snug" key in the boss of the pinion, adjacent to the shoulder of the shaft. This can be located on assembly, after the position of the pinion has been determined. It is only necessary to drill a No. 53 hole through the boss and into the shaft, sufficiently deeply to provide a secure seating for a pin made of 16-gauge steel wire, slightly tapered at the end. The hole in the pinion is then slotted out, as at C, Fig. 29, so that it can be assembled or removed from the shaft, the pin, after driving in, being filed off so that it does not project above the pinion boss.

It should be noted that pre-location of both crankshaft and camshaft keys is hardly practicable, because the three gears in the train are not in a straight line, or even necessarily in exactly determined relative positions, so that it would be a complicated (and in this case, rather unnecessary) matter to set out the positions of the keyways relative to the gear teeth. Incidentally, this difficulty is by no means non-existent, even in production practice; I have recently encountered an instance where several thousand gears were ordered from a well-known gear-cutting firm, with very explicit instructions regarding the position of the keyways. The instructions were accepted as quite explicit and practical by the gear specialists, but when delivered, all the keyways were found to be at different angles to the gear teeth!

## Idler Gear Stud

The idler gear (Fig. 29A) is intended to run on a "dead" shaft in the standard arrangement of the engine, though an optional arrangement, should it be desired to take an external drive from this gear, is to fix it on a "live" shaft running in a bush in the timing cover. One disadvantage of this arrangement, however, is that it is a little more difficult to ensure the meshing up of the gears in their correct timed positions before putting on the timing cover; and as auxiliary drives can be provided in other ways, it is considered better to use this pinion as its name implies, and nothing more.

On account of the proximity of the idler gear centre to the edge of the ball race housing, it is not practicable to screw the fixed stud into the face of the endplate, unless the rather awkward arrangement of a "joggle" stud with a considerable amount of eccentricity is adopted. The best way, therefore, is to make the stud with a flanged foot, as shown in Fig. 30, and secure it to the endplate by two screws, the outer end of the stud being secured in the timing cover by a nut. This makes the location and fitting of the stud, to give correct gear meshing, quite a simple matter.

The procedure recommended for this operation is as follows: Temporarily assemble the camshaft spur gear and the crankshaft pinion in their running positions, either by assembling the essential components of the engine, or preferably, by fitting dummy shafts to work in concentric bushes in the timing endplate. Assuming the idler stud to be made from $\frac{7}{8}$-in. dia. steel, one side of the flange will have to be cut away, but the other may be left on temporarily, to facilitate holding the stud in place on the endplate by means of a small tool-maker's clamp or similar means. Adjust the position of the stud, with the pinion on it, till the gears run quite smoothly and silently with the minimum backlash; then mark out and drill the holes for the two countersunk fixing screws.

It will be seen that the idler stud is hollow, and cross drilled on the under side to form an oilway. A hole should be drilled through the timing endplate, to line up as closely as possible with the bore of the stud, and thus allow oil mist to pass through from the crankcase to lubricate the bearing. It may be mentioned that "dead" shaft bearings are often difficult to lubricate, because the common practice of drilling a radial hole in the boss of the running member only defeats its own object by throwing the oil out by centrifugal force. This trouble is very prevalent in certain engines which have the cams and timing gear mounted on a sleeve which rotates on a fixed stud. The only way to lubricate this type of bearing properly is from the inside of the shaft.

After fitting, and completing the shaping of the base flange, the stud should be case-hardened, leaving the threaded end soft, or "letting it down" by subsequent re-heating. The heads of the fixing screws must not project above the base flange, or they will foul the gears.

## Location in Timing Cover

It is not absolutely necessary to fix the idler pinion stud at the outer end, but it is desirable on the grounds of extra security. This entails drilling a hole in exactly the right position in the boss of the timing case, to take the threaded end of the stud, and some constructors may consider it rather a difficult matter to locate this hole properly.

The method recommended is as follows: First set up the timing endplate in the lathe, with the idler stud fixed in position, and set to run dead truly. A convenient way of setting up is to pack the endplate up with a parallel ring or flat plate having a hole large enough to take the endplate spigot, and clamp it to the faceplate with a single bolt through the camshaft bush seating, leaving the main joint face clear. The stud should be centred with the aid of a test indicator, if available, to the closest possible limit of economic accuracy.

While the endplate is still set up in this position, the screws securing the stud are removed, and the timing cover is assembled in place, securing it by two or three screws. The boss for the stud may now be centred with a centre-drill, then drilled to take the stud, and spot

faced, with the assurance that the hole will line up exactly with the stud on assembly.

### Poetic Interlude

A few days ago I received the following cryptic message from a reader:

"Just of late, in our dear old "M.E."
Has appeared an engine of 15-c.c.

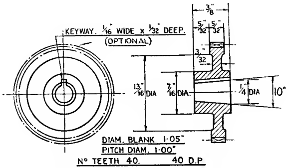



*Fig. 28. Camshaft spur gear*

With regard to this, your protege,
Your E's, I agree, are quite O.K.,
But although I'm sure you're not a liar,
It's a *three*, not a *two*, that you require."

After much exercise of the grey matter, or what is left of it, I came to the conclusion that this constitutes a reference to a slight error in the type number of the ball races used for the main bearings of the Seal engine, which, are $\frac{3}{8}$ in. bore by $\frac{7}{8}$ in. outside diameter by 7/32 in. wide, and were described as EE2's, but which I find are actually EE3's.

My reply to this very helpful correspondent was as follows:

Dear friend, I thank you for your mild correction,
I find 'twas my mistake, on close inspection;
Not only must I mind my P's and Q's,
But also, it would seem, my 3's and 2's!

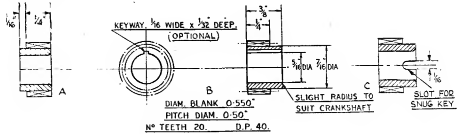



*Fig. 29. Pinions: (A) idler, (B) crankshaft pinion; (C) alternative and simplified method of keying pinion*

### Castings and Parts for the "Seal" Engine

Despite the assurance that these would be available, as soon as possible, and that an announcement would be made when they were ready, hardly a day passes but enquiries are received on this subject, and I have been rebuked by quite a few readers because of the delay in arranging for supplies. Although one is now deprived of the well-worn ex use so popular but a couple of years ago—"There's a war on!" — I should think hardly any reader would need reminding that at the present time there are many factors which are equally effective in holding up and delaying work or the delivery in goods. Castings are particularly difficult at present,

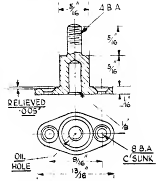



*Fig. 30. Idler stud*

owing to restrictions in both metal and fuel supplies, and I may mention that the last time I called at the foundry I found the proprietor out—touring the district on his bicycle, in the vain attempt to obtain a bag of coke to run his furnace! In these days of universal frustration, I beg of readers to spare both themselves and me unprofitable and embarrassing correspondence on this matter, even though most of us may feel that the quality of patience is already strained well beyond the elastic limit.

### Miniature Coils and Magnetos

Some time ago I referred to the miniature magnetos which are now produced by the Model Ignition and Accessories Co., of Ewell, Surrey. I have now heard from several readers who are using these magnetos successfully, including Mr. F. G. Buck, of Stoke-on-Trent, who informs me that a magneto of this type is working quite well on his record-breaking model car, and has enabled its performance to be still further improved.

I have recently inspected and tested two of the latest productions of the above firm: the M.I. "Unit" magneto, and the M.I. low-

consumption miniature coil. The former item is intended to simplify the adaptation of magneto ignition either to new or existing engines, be enabling the magneto to be built into the engine structure, instead of being an entirely separaty machine coupled to or otherwise driven from the engine shaft; a method which I have used in my own engines, and recommended in past articles.

The essential components—coil, stator and rotary magnet—are the same as those of the standard magneto, but the unit is not fitted with bearings or contact-breaker, as it will utilise those already fitted or designed for the engine. No condenser is necessary with these magnetos, though a small one connected across the points will increase their working life. The weight of the unit is 2¾ oz.

The M.I. "Lightweight" coil is wound on fairly orthodox lines, but achieves unusual economy of current by improved efficiency of the magnetic circuit, which is partially closed, and uses a special high-permeability alloy. It takes only 85 milliamps at 3 volts, and will work off a 2-cell "Penlite" dry battery; weight of coil, 1¾ oz. This coil has been used successfully by Mr. J. Cruickshank in his 10-c.c. model racing car.

There is, perhaps, one comment which should be made on the use of any ultra-miniature ignition equipment, to avoid disappointment by users, who are sometimes prone to expect too much from it in the way of electrical output. Although these tiny coils or magnetos are wonderfully efficient for their size, it must be fairly obvious that they deal with very small amounts of electrical energy, and that the spectacular sparking obtained from larger equipment is out of the question.

The ultimate function of any coil or magneto is to provide an effective ignition spark to run an engine at full efficiency; no matter how long or "fat" the spark may be, it cannot do more than this. I have heard the complaint that the spark obtained from lightweight coils or magnetos is very thin and almost non-luminous; but it is a fact that this tiny spark, properly applied to the plug, will effect ignition, just as surely as one absorbing half a kilowatt of energy.

*(To be continued.)*

# *Fuels for Small I.C. Engines*

I SEE in the issue of March 27th a reference made to the use of doped fuels in small high compression 2-stroke engines.

I notice that a mixture of 50 per cent. methanol, 30 per cent. petrol, and 20 per cent. castor oil, is used by one of your constructors.

Frankly, I do not understand this, because petrol and methanol are not mixable, and the addition of castor oil makes matters very much worse. The only way in which it is possible to mix methanol with petrol is to have a considerable proportion of pure benzol present. The mix then is quite satisfactory, provided that the mixture is quite dry and water is not present, and a limited quantity of castor oil can be added. Any attempt to mix methanol and petrol together results in the same sort of thing as when you try and mix paraffin and water, they separate out completely, and no amount of shaking will mix them at all. Also, if you only have just enough benzol present and mixing does occur, the addition of two drops of water will separate the methanol and petrol at once. It is possible your constructor is not aware of this and that his engine is running on a mixture globules of both types of fuel or running wholly on one or the other. We have known several racing cars do this, due to the ignorance of their owners.

From full-size racing practice I would suggest that a far better mix would be as follows:—50 per cent. methanol, 20 per cent. pure benzol, 8 per cent. acetone, 6 per cent. nitro-benzine, 16 per cent. pool petrol, or, better still, 73 octane, if you can get it.

The acetone assists starting and helps to keep the plugs, and that sort of thing, clean, and the nitro-benzine considerably improves distribution and atomisation of fuel and also helps petrol consumption.

The acetone and nitro-benzine are readily obtainable without licence, in limited quantities, from any of the well known houses, such as Imperial Chemical Industries, or British Industrial Solvents.

For the lubrication of two-stroke engines a mineral base oil, such as Essolube Racer, or Essolube 60 can be added, and is much superior to castor oil.

In all cases all mixes require trying in a glass before using in the engine to make quite sure they are mixing properly.

If a simpler mixture is required for 11 : 1 compression ratio, 15 per cent. methanol, 15 per cent. pure benzol, and 70 per cent. petrol, plus oil which may be required, will be found perfectly adequate because on 11 : 1 the compression ratio, with the poor filling that is obtained on two-strokes, would run quite well on the 50/50 petrol benzol mixture, but the addition of methanol will, of course, give a denser charge although, and this may not be generally realised among the small engines fraternity, the fuel air ratio of methanol mixtures are about 7 : 1 compared with petrol at 14, so that a main jet, two to two-and-a-half times the area, is required according to the proportion of methanol used; also, the calorific value is less than half that of petrol. I trust that this information will be of interest to readers.

—P. R. MONKHOUSE.

# *A Tandem Compound Engine

## By "Crank Head"

THE discharge pipe from the air-pump was the last item to be taken in hand, this pipe was of copper, $\frac{7}{16}$ in. external dia., and bent to a radius of $\frac{5}{8}$ in. inside the bend. Having a short bend at one end at right-angles did not tend to simplify matters. The short bend was first made (the pipe having previously been filled with lead); the pipe was then clamped to the angle-plate with the open end of the bend upwards, and, by means of the device previously described, the long bend was made. In this instance, the end roller, i.e. the one which would be on the inside of the bend, was the fixed one, the outer roller being mounted on the pin in such a manner as to make it free to revolve. It must be admitted that the bend was not perfect; a certain amount of flattening of the tube occurred, but it has to be looked for to be seen. This trouble seemed to be unavoidable on account of the small radius of the bend, together with the thin gauge of the tube used.

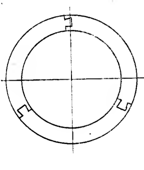


*Fig.* 34

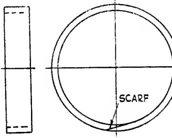



*Fig.* 35

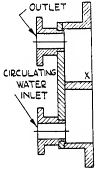



*Fig.* 36

The hotwell tank needs but little description, excepting that the plates were flanged, and seams riveted. It is made entirely of copper sheet about 1/64 in. thick; the cover is hinged, and when closed is a snug fit on the tank. A sump $1\frac{3}{8}$ in. dia. and $1\frac{1}{2}$ in. deep is built in the bottom of the tank from which the main feed-pump (to be described later) takes its suction. There is also a second suction pipe connected to the emergency hand-pump, which is fixed underneath the bed of the engine, and is actuated by the lever which is seen lying on the tiles, in one of the photographs.

It should have previously been stated, the capacity of the air-pump is approximately 1 cu. in., and that of the L.P. cylinder is 13.29 cu. in.; the pump is, or should be well up to its work, as the capacity of the air pump should be from 1/15 to 1/25 that of the L.P. cylinder.

The condenser was next dealt with, and with the only material available for its construction grave doubts were at first entertained as to what could be done. Reference to various text books showed that, for an ordinary triple-expansion engine, 1.3 sq. ft. of cooling surface was required per 1 I.H.P. It was assumed that, as a maximum, not more than $\frac{1}{2}$ I.H.P. would be expected from the engine, and this was considered a liberal estimate. That being the case, anything above 1 sq. ft. of cooling surface would be acceptable, but much more was desirable if it could be obtained.

The shell of the condenser is a solid-drawn brass tube 5 in. long by $3\frac{1}{2}$ in. bore, and was originally the cylinder of a pneumatic door-stop; it was about 1/32 in thick. All the cooling surface, then, had to be crowded into this space. As there was no steam pressure to be considered, the tubes could be very closely spaced; after making several sketches, it was found that, by spacing tubes $\frac{1}{4}$ in. ext. diameter $\frac{5}{16}$ in. apart, measured vertically, and $\frac{3}{8}$ in. apart in the rows, 52 tubes could be fitted. Each tube was $4\frac{7}{8}$ in. long between the tube-plates so that an area of nearly 200 square inches of cooling surface was obtained; it is anticipated this will be sufficient.

The fun now began, for although sufficient tubing of $\frac{1}{4}$ in. ext. dia. was available, no material for tube-plates, flanges, or water spaces could be found, and as the town in which this job was being done is a seaside holiday resort in Cornwall, it will be appreciated that there were not many likely sources of supply. After some enquiries had been made, a kindred spirit was discovered, viz. a plumber who is also a keen model maker, his speciality being old sailing ships, and through his good offices a piece of $\frac{1}{8}$ in. sheet brass large enough to make the tube-plates was obtained, for which I had to wait only three months, so something had been accomplished!

The next question was the flanges for the ends of the condenser shell, and water spaces; the

*Continued from page 644, "M.E." May 22, 1947.

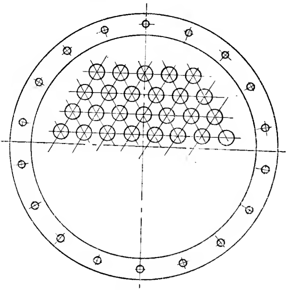


*Fig.* 37

following method was adopted in producing them. Some pieces of sheet brass $\frac{1}{8}$ in. thick varying from 4 in. to 6 in. in length were available, and from these as many pieces $\frac{1}{2}$ in. wide as possible were cut. The strips were filed up parallel, and annealed, and by means of the tube-bending device, and a piece of steel plate filed up to a radius of $1\frac{3}{4}$ in., the strips were bent round on their flat to make segments of a circle.

In the case of the longer pieces, two were sufficient to make one ring ; in the other cases three pieces were required. A circle $3\frac{1}{2}$ in. in diameter was drawn on a piece of wood, and each length fitted to the circle, the segments were then cut to the length of 1/3 of the circumference of the circle plus $\frac{1}{4}$ in. and dovetailed at each end as in Fig. 34.

This procedure was continued until sufficient pieces to make four rings had been produced. The pieces were then assembled to form rings, and the joints silver-soldered. The shell of the condenser was now mounted on a wood mandrel, and held between the lathe centres ; the ends were squared up, and screwed for a distance of $\frac{3}{16}$ in. from each end 40 threads per inch. Two of the rings were now placed in the lathe, one at a time, one face trued up, and then bored and screw-cut to fit snugly on ends of the shell ; they were then screwed on, and sweated with soft solder.

The shell, with what were now flanges on, was again placed on the mandrel, and the external diameter of flanges turned, and faces for jointing the tube-plates trued up. The tube-plates having been roughly cut to shape, now each had a piece of round brass sweated on one side as near the centre as possible ; this was to enable the plates to be held in the chuck whilst machining the spigot on the one side to fit in the bore of the condenser shell, and to face up the other side to make the water space joints ; also to turn the outer edge to the finished diameter. Two centre-lines intersecting one another at right angles were marked on the spigot side of each plate ; then the plates were removed from the lathe and the chucking-pieces removed. Working on the spigoted side of one plate, all the tube holes were marked off for drilling, and two of the holes, one in the top, and one in the bottom row were drilled.

The two plates were then placed together back to back and faired up, and the holes previously drilled, marked off on the second plate, these were then carefully drilled, and the two plates bolted together with fitted bolts, and the remaining tube-holes drilled through both plates. It should have been stated that before any machining of the tube-plates was done, they were both tinned all over on one side, to permit of the ends of the tubes being sweated in, should it prove to be necessary. Whilst the tube-plates were still bolted together, the bolt holes for holding the plates to the condenser shell were marked off and drilled, the plates being drilled together to facilitate getting the tube-holes exactly in line when securing the plates to the shell.

The plates were now separated and bolt-holes in the flange on one end of the shell drilled, centre-lines having been marked on the shell. No difficulty was experienced in setting the tube-plates with the tube-holes in alignment. The jointing faces of the tube-plates, and shell ends were now lightly tinned, a precautionary measure, as a small leak in either of these joints would not assist in obtaining a vacuum in the condenser.

The water-spaces now claimed attention ; here again, it was a case of building up. The flanges having been made at the same time as those for the condenser shell, the only parts

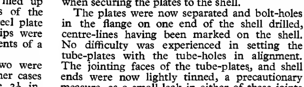


*Fig.* 38

required were the tubular portions forming the body of the water-spaces, and the covers or bottom, whichever they may be called. The sides were made from a piece of brass curtain-rail about $\frac{1}{2}$ in. wide $\times$ $\frac{1}{16}$ in. thick ; they were bent up on their edge to form short tubes, the ends scarphed and silver-soldered together ;

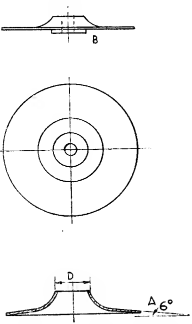



*Fig.* 39

Fig. 35 will explain this. The flat covers were cut from an old front-door name-plate, which, unfortunately, was less than $\frac{1}{16}$ in. thick, and having had the lettering engraved deeply into it, rendered it nearly impossible to get the covers truly level, i.e. to show a perfectly level surface on the outside when they were polished; and being so thin originally nothing in the way of turning, and very little filing could be safely done.

The front water-space, in addition to having to accommodate the inlet and discharge connections for the circulating water, had also to be fitted with a diaphram across its centre to cause the circulating water to make two passes through the tubes. This is shown in Fig. 36, which also indicates the number of pieces which make up this component. All joints excepting the scarph in Fig. 35 were soft-soldered, the unknown composition of parts of this structure made the risk of silver-soldering too great; at its worst, a leak in the water space would cause nothing more serious than a mess, and probably the use of a little sulphurous language.

Fig. 37 is a view of one tube-plate, showing the spacing of tubes, spigot, and holes for jointing bolts. The mountings on the shell of the condenser are: exhaust inlet from main engine, exhaust connections from Main Feed Pump, exhaust from Circulating Engine, vacuum gauge connection, and lastly, the Air-Pump suction-pipe. The inlet from the main engine, and air-pump suction-pipes are each silver-soldered into a saddle-plate which fits over the shell of the condenser, and is secured to the latter by $\frac{1}{16}$ in. rivets; the shell of the condenser, and under-side of the saddle-plates were tinned, and after riveting the whole lot was sweated together. A separate doubling plate is similarly secured to the top of the condenser to accommodate the other exhaust connections, which are screwed into this doubling plate and condenser, and then sweated into position.

Fig. 38 shows a side elevation of the connection to the air-pump suction; it consists of a piece of $\frac{1}{2}$ in. tube cut at an angle as illustrated, and silver-soldered into the saddle-plate. The whole is then riveted and sweated to the under-side of condenser shell. The reason for fitting the pipe in this manner was, first, to get an easy run down through the t led floor to air-pump suction, and, secondly, to give the condensate an easier flow into the suction-pipe, the shape of the orifice in the condenser shell being rectangular with rounded ends. Fig. 38 is an elevation of the pipe under discussion.

Having prepared all the parts and cut all the tubes to the required length, and annealed each end of them, the tube-plates were placed in

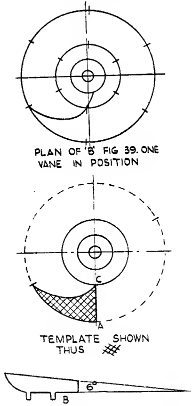



*Fig.* 40

position, and bolted, care being taken that the jointing faces were close. A check was now made to ensure that the tube-plates were in their correct positions relative to one another; this being satisfactory, each plate and flange were carefully heated with a blow-lamp, until the tinning melted. Whilst still hot the bolts were all tightened up, and the whole allowed to cool,

and the tube-plates were now securely attached to the shell. Each end of each tube was polished, and lightly tinned, threaded through the tube-plates, and each one expanded into position by means of a tapered drift.

A pressure gauge was now fitted to the connection intended for the vacuum gauge, and the test pump connected to the air-pump suction-pipe; all other connections but the exhaust inlet from main engine were blanked off, and when the condenser was absolutely full of water, the blank was applied to the exhaust inlet. At 10 lb. per sq. in., everything was tight, but above that pressure, some of the tubes began to leak, and no reasonable amount of drifting would make them tight beyond 20 lb. per sq. in. and 30 lb. was the test pressure aimed at. Consequently, the water was drained out, and the ends of the tubes heated and sweated to the tube-plates. Pressure was again applied and this time with complete success. It is understood that this tinning business is not in accordance with engineering practice, and the writer has personally the greatest contempt for its use; but, under the circumstances, i.e. thin tube-plates, and tubes about twice as thick as desirable, there appeared to be no alternative; so soft solder it had to be. Other than the knowledge that solder has been used, no other troubles are anticipated; working conditions will however supply the answer.

The nuts were now removed from the bolts, which latter, by the way, were also sweated in (not intentionally) and the water-spaces placed in position, the joints being of oiled paper. In the case of the front water space, the joint included a portion under the diaphragm at X, Fig. 36; it is necessary for this joint to be watertight, as the incoming circulating-water must not pass it, the idea being to cause the water to flow through the lower section of tubes on its inward passage, and through the upper section on its outward passage. This completed the construction of the condenser.

Up to this time, no material was available for constructing the circulating-pump so a well-known firm of model engineers were approached *re* a set of castings for same; nothing doing! The idea of the pump was abandoned; but whilst taking a walk, the writer had the good fortune to see in the road a 1-lb. brass weight, which some unfortunate person had dropped from, it is assumed, a delivery van; so this weight was earmarked for the casing of a centrifugal pump and the photograph will show with what success it fulfilled its mission.

The first operation was to bore out the inside of what shall now be called the pump casing, to somewhat near the finished diameter which is about 2 in. and to the required depth, at the same time boring the centre hole to which the bearing for the shaft had to be fitted. The casing was now reversed in the chuck, and set up so that the centre hole was running truly, and the whole of the turning on the outside was completed, a light cut being again taken through the centre hole, and the surrounding metal turned off to form a good bearing for the collar which would be turned on the bearing. The bearing was now turned up externally, and a spigot turned on the end which was a shrink fit in the central hole previously bored in the casing.

The two pieces were now shrunk together, and again held in the chuck with the open side of the casing outwards. The hole for the shaft was drilled, bored and reamed $\frac{1}{4}$ in. which was to be the diameter of the shaft carrying the impeller. At this setting, the inside bore of the casing was finished to 1.985 in. diameter, and the back of casing finished; before removing, the position of the discharge branch was marked off.

Here a correction must be made, for which apologies are offered. Before the inside of the casing, and boring of the bearing were done, the discharge passage was cut, and the discharge branch fitted and silver-soldered in position. The whole casing was then mounted in the chuck, held by the bearing, and the inside of casing and bore for the shaft finished, as described.

A mandrel was now turned (held in the chuck) which was a good fit in the bore of the casing, the casing was mounted on this mandrel, and the end of the bearing bored for the stuffing-box, and screw-cut, and the gland made and fitted. This, for the time, completed the work on the casing.

At this juncture, the method of cutting the discharge passage might be explained. The casing was mounted on an angle-plate on the vertical slide, and, commencing with a small stiff drill 3/32 in. dia., a hole was drilled at the top edge of the discharge passage, deep enough to allow another drill $\frac{1}{8}$ in. dia. to follow it without running out of centre. This operation was continued until a $\frac{3}{16}$ in. drill could be put right through the side of the casing; this hole formed the starting position for a $\frac{3}{16}$ in. end-mill to work from, and by careful feeding with light cuts, the passage was finally milled out $\frac{3}{16}$ in. by $\frac{1}{2}$ in. which is the finished size. After each drill had been run in the hole previously drilled, a small flat had to be filed from the top edge of the hole to give the following drill a fair start. This method was definitely unorthodox, but saved a lot of work in temporarily building up the casing in order to get a square face to work from, and by good luck proved successful.

The impeller was the next item to be tackled, and as it was intended to obtain the greatest efficiency possible from the pump, no pains were spared. The result, at least from the point of view of appearance, can be judged from the photograph of the finished pump. The first part of the impeller to be made was the back-plate, which was made from a discarded wheel of an old model railway wagon, which had been given me, and fortunately, was made without spokes, the only defect being the small hole seen in the outer plate of the impeller in the photograph. Two wheels were used in the making of the impeller and both were alike, so the hole appeared in both.

To revert to the construction, the first plate was turned up to the shape shown in Fig. 39B, the hole in the centre being $\frac{3}{16}$ in. dia., and tapped 36 threads per inch. the smallest external diameter of the boss being $\frac{1}{2}$ in., and the streamlining was turned to a radius of $\frac{7}{16}$ in., the thickness of the flat portion being 1/32 in., and the external diameter 2 1/32 in., the diameter of the boss on the back side of plate being $\frac{5}{8}$ in. $\times$ $\frac{1}{16}$ in.

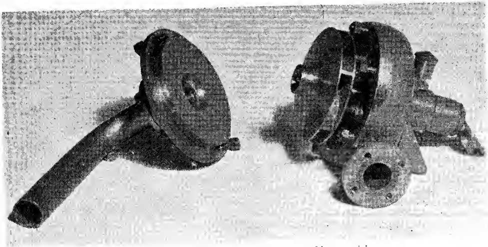
thick. These latter dimensions do not matter ; it was just convenient to make them to the sizes stated. Before removing from the chuck, six radial lines equally spaced were marked across the inner face of the plate.

The vanes were the next consideration, and they are as near as could be made true involutes of a circle. The true shape was developed geometrically to scale, and a metal template made to the correct shape. The vanes were then marked off as illustrated at Fig. 40B, the angle between the top and bottom edges being 6 deg. Two small pins, 1/32 -in. dia., and long enough to reach through the back-plate, were left on the bottom edge of each vane ; these pins passed through suitable holes drilled in B, Fig. 40, and were than riveted over. Each vane, and there are six of them, was carefully bent to the template, Fig. 40A, they are of brass and 1/32 in. thick. The template, Fig. 40A, was then laid on the inside face of the back-plate with its outer point on one of the radial lines which had previously been marked, and gradually swung round keeping the outer point stationary on the line, until the inner point met the base of the streamlined cone C, Fig. 40 ; a line scribed from the inner edge of the template gave the vane position.

This process was repeated six times, the rivet holes were then marked off on the plate at the correct pitch, and drilled. Each vane was then placed in position and the pins riveted over ; the whole of the vanes were then silver-soldered in position at one operation. So far, so good ! The next operation was to mount the now partly-assembled impeller on a screwed mandrel in the chuck and turn the top edges of the vanes to the correct angle, 6 deg. Although when cutting the vanes they were cut to the correct angle, bending and silver-soldering threw them out of shape slightly.

Could the turning be done without wrecking the whole show ? That was the question. It was managed all right, high speed, sharp tool, very light cuts and plenty of good luck, whatever the latter may be, and the result was quite as good as hoped for. At this setting, nothing was done to the periphery of the impeller, for all the vanes had been cut to a uniform length before assembling.

The outer plate, or shroud, Fig. 39A, was next tackled, and was made 1/32 in. thick, and 2 1/32 in. diameter, turned to the same angle as the top of the vanes. The inside surface of the shroud was then tinned, also the top edges of the vanes ; it was then carefully set in position, and lightly clamped. The whole was then heated until the tin ran, and then allowed to cool.



*Circulating pump. Impeller not in working postition*

The next thing was to make and screw the shaft on which the impeller was to be finally mounted. This was made, and then chucked to run absolutely true, or at least as near as could be checked by a test gauge ; the impeller was then finally screwed on, and locked with a stream-lined nut, and a couple of *very light* cuts taken all over it, at the same time reducing the diameter to the correct size, which is 1.982 in., which is 0.003 in. smaller than the bore of the casing, and is considered good enough.

It should be here stated the bore at D, Fig. 39A, is equal to the internal diameter of the suction-pipe. The next item was the cover ; it spigots into the casing, and the inner face is machined to the same angle as the outside of the impeller. The streamlined boss of the impeller protrudes through a similar-shaped orifice in the spigot, very little clearance being allowed, and the end of suction pipe very nearly touches the boss on impeller ; the idea being that the water shall flow straight from the suction pipe into the impeller, and not get into the casing. A further precaution to ensure that result is that only 0.004 in. clearance is allowed between the impeller and the cover ; in other words, there is a lateral clearance of 0.004 in. between the casing and impeller. The cover of the pump is also a built-up concern, three separate pieces, shrunk, and riveted together.

*(To be continued)*

# Editor's Correspondence

### The "Ideal Lathe" Competition

DEAR SIR,—Since writing my article for the "Ideal Lathe" competition which appeared in the May 15 issue, I have received advice from the ball-bearing manufacturers which indicates quite definitely that the use of two separate angular contact bearings, mounted, of course, in opposition, is much to be preferred, so the design should include this, for using two Hoffmann Medium Series M.S.9.A.C. Angular Contact bearings, or equivalent.

Yours faithfully,

Harrow. K. N. HARRIS.

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DEAR SIR,—Following on the description of my entry for the above competition published in last week's issue of THE MODEL ENGINEER, I would like to add that I have endeavoured, not only to produce a substantial model of maximum capacity, but also to introduce a design which will tend to overcome the serious handicap high production costs of the present period offer to the successful marketing of any model.

I have, for this reason, recommended bronze bush-bearings, and generally, a simplicity of detail. Furthermore, I have outlined a scheme whereby the lathe could be obtained in various assembled "kit" forms, ranging from an elementary, or foundation kit, to the fully Ideal assembly, yet each model having an appearance of completeness in itself. In this way a reliable machine would be available to model engineers and mechanics of the modest means and also to the better-off enthusiasts. Supplementary kits, or even individual items, could be obtainable under a system of standardisation of parts and thus enable additions to be made to interim kit models without causing financial embarrassment to the owners.

Yours faithfully,

Reading. D. E. GFATER.

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### Small Steam Turbines

DEAR SIR,—May I be allowed to thank Mr. Lindsey for his letter which appeared in the April 3rd issue of THE MODEL ENGINEER, and also to congratulate him on being the first with the information therein. Now, at last, we have a good idea what to expect from a small engine and a basis for comparison. Naturally, the results have caused me a little disappointment, I thought I had good cause to believe that my turbine was at least equal in performance. I know its efficiency can be improved by the use of a larger nozzle, passing more steam, but that would make it rather too powerful for the job in view. I must cogitate and endeavour to improve matters.

Now that Mr. Lindsey is equipped for testing, I wonder if he could be prevailed upon to add to his figures and conduct a test under full load conditions, in which the engine speed would be kept constant at, say, 2,000 r.p.m. by loading the friction belt, instead of throttling the steam. He admits that linking up would be preferable at the smaller powers. I think a test of this nature would be even more illuminating though, no doubt, more disappointing to me. Maybe he could weigh his engine too, as I should be very glad of such figures.

I would like to comment upon the method of speed measurement, a delightfully simple method as Mr. Lindsey must have realised, but I think he would be wiser to use only one white sector on his flywheel, instead of 3 or 4, according to the speed required, which may easily lead to ambiguity, as a little thought will show. A neon lamp used on 50 c.p.s. A.C. mains flashes on each half-cycle, i.e. 6,000 times per minute. Using, say, 4 white sectors, they will appear stationary at the odd and even harmonic speeds, such as 6,000, 4,500, 3,000, 2,250, 1,500 r.p.m. etc. Moreover, because the neon lamp electrodes are not usually of the same area or disposition, the positive and negative half-cycles give different illumination intensities, making it possible to mistake 1,500 for 750 r.p.m. for instance. (I hope he used the correct one.) It is better to use but one sector, as this will give speeds of 6,000, 3,000, 2,000, 1,500, 1,200 r.p.m. etc. when 1, 2, 3, 4, or 5 etc. sectors appear, thus giving quite definite speed readings. It will be noticed that of the two sectors seen at 3,000 r.p.m. one will appear brighter than the other, a similar effect appearing at 1,500 and 1,000 r.p.m.

I am pleased to see that he concludes with a mention of boat propulsion. I have stated before that steam consumption is not necessarily the only ground for comparison between reciprocators and turbines, and that suitability for the job in hand may be equally important, the model boat providing an excellent example. Assuming a reasonable steam consumption, the turbine, even in its simplest form, possesses the advantages of lighter weight lower in the hull, constant and very even torque, and it is self-starting. Because of its preference for high speeds, it is possible to use a propeller more nearly to scale size, with a pitch-diameter ratio near unity, and thus propel the boat instead of trying to capsize it with an abnormally coarse screw. I consider these points very important.

In connection with the latter sweeping statement, may I refer to Mr. Henshall's appreciative letter of November 7th, 1946, and in thanking him, would like to add to his figures a column referring to a boat of mine that has undergone more or less final tests during the past few days. It represents a $\frac{3}{8}$-in. scale model of the S.Y.

*Turbinia*, as first built, with a single screw—built by hearsay—very little information being available at the time. If other readers care to compare the results the significance of the statements above will, I think, be appreciated. The details are :—

Type of craft.—Destroyer type hull. $37\frac{1}{2}$ in. $\times$ $3\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. draught.

Type of boiler.—Horizontal water tube, like "Mollyettes" boiler, but 20 per cent. larger.
Boiler heating surface.—25 sq. in. approximately.

Type of Fuel.—Lighter fuel, used in a very small blow lamp.
Boiler Pressure.—80 P.S.I. maximum. 60 P.S.I. working.

Type of Pump.—No pump. Water consumption $\frac{1}{4}$ oz. per min. at 80 P.S.I.
Remarks.—No superheat or feed heating.

Type of Engine.—Simple impulse turbine rotor 1.25 in. dia., 48 blades, geared down 10-1.
Approximate R.P.M. on load.—30,000 plus.
S.H.P.—0.006 at 3,000 r.p.m.

Type of Prop.—2 bladed $1\frac{1}{8}$ in dia., 2 in pitch approximately.

Approximate Speed.—6 m.p.h. in fairly open waters, during the half gale of Easter Sunday.

In conclusion, may I express the hope that others besides Messrs. Lindsey and Henshall will be prompted to seek further, and not be content with the fact that their engines "go round," but to measure how well they do so.

Yours faithfully,

St. Albans. WALTER H. ELKIN.

## Fuel Stoppage in Model Petrol Engines

DEAR SIR,—With reference to Query No. 8012 which was dealt with in a recent issue of THE MODEL ENGINEER, I should like to inform you that I have had exactly the same trouble on the new Atom Minor engine which I have recently completed. The trouble reached a climax when exhibiting this engine at a local society meeting, when it ran for 30 secs. or so and then, to my embarrassment, petered out and would not re-start.

I have been able to trace the fault to a blockage of the fuel supply. It appears that the oil in the petrol-oil mixture which is left in the fuel supply pipe after previous running, is sucked up when the engine is re-started at a later date, and blocks the carburettor jet.

The engine can be kept running by repeatedly opening the needle valve as W.J.P. has discovered, but in any case the engine eventually stops, and cannot be re-started.

I have overcome this difficulty by blowing down the carburettor air intake (with the piston near the bottom of its stroke). This forces air down the fuel supply pipe, and when it is heard bubbling through the fuel in the tank I know that I can start the engine with confidence, and that it will keep running. I have found this necessary even when taking the precaution of draining any residual fuel at the end of a run.

I appreciate that this procedure would be rather difficult when the engine is installed in a model.

In connection with the new Atom Minor engine, the drawing calls for a carburettor choke diameter of 3/32 in. This appears to be very small, and in practice, results in the engine being throttled and the needle valve adjustment being very critical, in view of the fierce suction. I have already opened up this choke to over $\frac{1}{8}$ in. with improved running results, and wish to verify that perhaps there is a drawing error, and that this choke should, in fact, be $\frac{3}{16}$ in. and not 3/32 in.

Yours faithfully,

Belfast. A. S. KNOWLES, F/LT.

[The dimension of 3/32 in. on the drawing is an error, as our correspondent suggests. The correct dimension is 5/32 in., which will be found in blue prints now issued.—ED., M.E.].

## G.W.R. Locomotives

DEAR SIR,—I have been very much interested by the comments by "L.B.S.C." and others, regarding the revival of some of the older locomotive designs from back volumes of THE MODEL ENGINEER.

While I am all in favour of the idea, I must strongly support "L.B.S.C.'s" suggestions that the particulars of the original boilers, cylinders, valve-gears etc. should be most carefully considered with the idea of modifying them all on more up-to-date data.

This does not mean that boiler dimensions should merely be enlarged ; I am of the opinion that most, if not all, of the original boilers can remain unchanged in their diameters and lengths, and that the tubing alone requires altering.

A very lovely model of the *Gooch* could be made by taking as a basis Mr. F. C. Hambleton's drawing, published in THE MODEL ENGINEER for April 26, 1945 ; but when I knew this engine forty years ago, the smokebox had been extended about 11 inches, and the later style of boiler feed clackbox had replaced the one shown in the drawing, thereby somewhat improving the appearance. Incidentally, exactly similar alterations were made to the Dean 7-ft. 8-in. single-wheelers that had not been re-built.

Regarding the cab of the model *Gooch* referred to by Mr. Richards, in his letter published on April 24th last, I recall the well-merited criticism of it. The real point about it was that, had a full-size engine been fitted with a scaled-up version of it, the crew would always be in each other's way in the course of their work ; the look-out ahead would be impossible by the driver while the fireman was firing, as anyone familiar with footplate work can easily see for himself. Mistakes of this kind frequently happen when a model maker decides to introduce a modification of his own in an otherwise satisfactory prototype. The moral of this is, of course, to stick to the prototype in a "prototype" model!

Yours faithfully,

"CHURCHWARDIAN."